DOCUMENT RESUME

ED 313 682 CS 009 875

AUTHOR Bricker, Elizabeth J.
TITLE The Effect of Advance Organizers in the Teaching of Science.
PUB DATE Dec 89
NOTE 20p.; M.A. Thesis, Kean College.
PUB TYPE Dissertations/Theses - Master Theses (042) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Advance Organizers; Comparative Analysis; *Content Area Reading; Grade 2; Grade 3; Grade 4; Intermediate Grades; Learning Activities; Primary Education; Reading Research; *Science Projects
IDENTIFIERS New Jersey

ABSTRACT

A study was conducted to show that there would be no difference between two samples' abilities to complete a hands-on science project when one is provided with advance organizers and the other is not. The sample of students were second, third, and fourth graders from the science program in Piscataway Township Schools in New Jersey. The experimental sample and the control sample each consisted of 10 randomly selected, heterogeneously grouped students from a suburban community. The experimental sample was presented with an advanced organizer providing information to complete a hands-on science project. The control group was given oral directions to complete the same hands-on science project. Each group was evaluated with the use of a checklist. Results indicated that the use of an advance organizer resulted in no significant difference between the abilities of the control and experimental samples. In fact, the addition of the advance organizer hindered the completion of the science activities. Children left with an advance organizer were somewhat confused about its use and interrupted the examiner with questions. (Thirty-six references are attached.) (MG)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED313682

THE EFFECT OF ADVANCE ORGANIZERS IN THE TEACHING OF SCIENCE

By

Elizabeth J. Bricker

Presented in partial fulfillment of the requirement for the
Master of Arts Degree
Kean College of New Jersey

December 1989

Accepted
12/14/89

- CS009875

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Elizabeth J. Bricker

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Table of Contents

		Page
I.	Abstract	ii
II.	Acknowledgment	iii
III.	Introduction	1
	Hypothesis	2
	Procedure	2
	Results	3
	Conclusions	3
IV.	Related Research	4
V.	References	12

Abstract

Two groups of second, third, and fourth grade students were involved in this study. The experimental and the control samples consisted of ten students. It was hypothesized that there would be no difference between two samples abilities to complete a hands-on science project when one is provided with advance organizers, and the other is not.

The statistical analysis of this study indicated that there was no significant difference between the abilities of the two groups.

Acknowledgment

I would like to thank the second, third, and fourth graders from the Piscataway Township Schools who were the subjects of this study.

I would also like to thank Dr. Mazurkiewicz for his guidance throughout this study. Thank you to my family for their encouragment.

Many science educators are concerned with students' ability to understand science as a process and with their conceptions of scientific knowledge. Since the reading level of each student in the classroom may effect content area text comprehension, individual students can have great difficulty understanding the organization of information in their science textbook.

Part of the problem may reside in the texts themselves as suggested by Farris. In a study entitled "Text Organizaton and Structure in Science Textbooks", Farris (1988) examined elementary science textbooks (grades four and six), noting text organization and structure, and the degree of problem solving required in chapter activities (according to Bloom's taxonomy). Farris reports a need for a more varied use of text structures and the inclusion of activities that utilize higher-level thinking processes.

One possible solution to the problem of comprehension of science material is suggested by the existing research. Kirkland (1981) conducted a study entitled "The Effects of Advanced Organizers on the Reading Comprehension of Compensatory Education Students" that examined whether the frequent use of advance organizers in the content areas would significantly improve the reading comprehension of junior high school compensatory education students. A standardized

reading test was used as both a pretest and a posttest. The results showed that advance organizers could significantly improve the reading comrehension of compensatory education students. These studies give grounds for using advance organizers when learning in the content area subjects.

Hypothesis

To add to the body of knowledge on this topic, the following study was established. It was hypothesized that there would be no difference between two samples abilities to complete a hands-on science project when one is provided with advance organizers, and the other is not.

Procedure

The sample of students for this study were second, third, and fourth graders from the science program in Piscataway Township Schools. The experimental sample and the control group each consisted of ten randomly selected, heterogenously grouped students from a suburban community.

The experimental sample was presented with an advanced organizer providing information to complete a hands-on science project. Vocabulary words were defined for those who needed clarification. The materials for each project were identified. Students were asked to predict the results of the experiment.

The control group was given oral directions to complete the same hands-on science project. Materials were not identified. Students were not asked to predict outcomes.

The experimental sample and the control group were evaluated with the use of a checklist.

Results

The following table shows the results of the checklist

CALCULATED STATISTICAL RESULTS

Sample	Mean	SD	t	DF
Experimental	7.2	2.44	2.50	18
Control	9.3	1.06		

used to evaluate the control group and the experimental sample. This illustrates that the use of an advance organizer is significant below the 5% level.

Conclusions

The results of this study indicated that the use of an advance organizer resulted in no significant difference between the abilities of the control and experimental samples. In fact the addition of the advance organizer hindered the completion of the science activities. Children left with an advance organizer were not clear about its use and interrupted the examiner with questions.

Students asked questions pertaining to the intended use of the advance organizer. Instead of focusing on the completion of an activity, students asked for approval before proceding to the next step. Students in the experimental sample may not have been familiar enough with the intended use of an advance organizer, making its use ineffective.

ADVANCE ORGANIZERS: RELATED RESEARCH

Zeitoun (1983) prescribed a procedure of operationalizing advance organizers in a study entitled "Operationalizing Advance Organizers: A New Procedure." This can be utilized by researchers to construct effective advance organizers. The procedure is based mainly on the Ausubelian propositions related to advance organizers and on empirical findings of advance organizer research. The eight steps involved in the procedure are: 1. analyzing learning materials; 2. mapping the cognitive structures of learners; 3. determining characteristics of the advance organizer; 4. estimating the readability of the advance organizer; 5. checking the understandability of the advance organizer; 6. assessing the study time of the advance organizer; 7. valuing the validity of the advance organizer; 8. revising the advance organizer.

Ausubel (1960) found advance organizers benefit learning and retention in a study entitled "The Use of Advance Organizers in the Learning and Retention of Meaningful Verbal Material." At the University of Illinois, Ausubel studied 120 senior undergraduate students of an educational psychology course. The experimental group heard an introduction to a passage with background information designed to organize their thoughts. The control group heard an introduction to the same passage with information designed to motivate student interest. Both groups were given the passage to study for

thirty-five minutes. Three days later, both groups took a test that pertained to information from the passage. Test results were in favor of the experimental group. Ausubel feels that the use of advance organizers help integrate new information into already existing concepts in the learners mind.

West (1981) conducted a study entitled "The Meaningful Learning of Intellectual Skills: An Application of Ausubel's Subsumption Theory to the Domain of Intellectual Skills Learning." West tested the applicability of Ausubel's theory to the meaningful learning of intellectual skills. The results of three studies of high school students indicate that advance organizers enhance learning of skills. This effect was removed if prior teaching in relevant background knowledge was included.

Darch and Carnine (1986) compared two approaches to content area instruction in a study entitled "Teaching Content Area Material to Learning Disabled Students." One treatment presented intermediate grade learning disabled students with information using an advance organizer in the form of a visual display, the other via text. Results indicated significant positive effects for the group taught with visual displays.

Hawk (1986) conducted a study entitled "Using Graphic Organizers to Increase Achievement in Middle School Life Science." Hawk determined that graphic organizers are effective in increasing the achievement of sixth-grade and seventh-grade middle school students who used the organizers.

Adejumo and Ehindero (1980) investigated the use of advance organizers in a study entitled "Facilitating Learning of Science-Oriented Textual Material in a Developing Country: Study in the Use of Organizers." Students were involved in the preparation of organizers to enhance meaningful learning from textual material with Nigerian secondary school students. Results indicated the proficiency in English as a second language was an important factor in determining effectiveness of student involvement.

In a research study conducted by Levin (1986) entitled "Mnemonic Facilitation of Text-Embedded Science Facts" eighth-grade students read passages that described three attributes of eight North American minerals. Mnemonic instruction, given to one-third of the students, generally produced greater memory for the minerals' attributes. Implications of the findings are discussed with specific regard to remembering scientific taxonomies and their associated facts.

Adamson (1980) said that the purpose of reading is to integrate new and existing knowledge, and that the reader's knowledge, opinions, or experience should be emphasized as much as the text content. In his study entitled "Prediction and Reflection in Reading in a Foreign Language" Adamson used a technique that involves the use of pre-reading questions exploring the reader's opinions. These questions accompany the text and encourage evaluation of the opinions expressed in the text as it is read. Exercises encourage the reader to

predict what subsequent text will contain. Use of this approach among science students required presenting the prediction exercises as a comprehension test and adjusting the technique based on the students' responses. The advantage to the use of prediction is that it allows an insight into the cognitive processes at work when a reader approaches text, and it emphasizes the role of background knowledge and experience in comprehension. Adamson stated that the immediate value of this type of work lies in establishing habits of looking at texts as completed artefacts, rather than as opportunities for mental interaction. The long term value of predictive work has yet to be proven.

The effectiveness of having 51 students generate their own headings for scientific text is assessed in a study by Brooks (1983) entitled "Generation of Descriptive Text Headings." Results reveal that generating headings enhances ability to recall information.

Mayer (1983) conducted a study entitled "What Have We Learned about Increasing the Meaningfulness of Science Prose." He discusses five instructional strategies for increasing the meaningfulness of technical or scientific information. These include organization of prose, use of concrete analogies and advance organizers, use of inserted questions in prose, elaboration activities such as note-taking, and discovery learning.

"The Reality of General Cognitive Operations" by Lawson (1982) examines Novak's position that science and mathematics educators should discard Piaget's theory of intellectual development in favor of Ausubel's theory of meaningful learning as a guide for teaching practice and research.

Gennaro (1981) conducted a study entitled "The Effectiveness of Using Previsit Instructional Materials on Learning for a Museum Field Trip Experience." Ten earth science classes were assigned to experimental and control groups. Previsit instructional materials were found to significantly increase student test scores.

In a study conducted by Giles (1982) entitled "Investigating Learning Mediators in the Planetarium Classroom" problems were addressed concerning context organization and learning mediators in platetarium classrooms. It was hypothesized that advance organizers and clustering singly and in combination would be more effective learning mediators than traditional planetarium instruction lacking these mediators. Posttest results indicated that advance organizers and clustering applied singly improved results of instruction when compared with a traditional planetarium presentation not utilizing these mediators, suggesting their incorporation into planetarium presentations.

Jacobowitz (1980) in a study entitled "Teaching Previewing Techniques to High School Students" found that the strategies of active surveying and active skimming are

previewing techniques that may enable high school students to discover independently the macrostructure of expository materials. Research has indicated that advanced knowledge of textbook structure improves reading comprehension by serving as a framework for organizing new, incoming information. The two reading strategies help supply advanced knowledge, while developing and reinforcing skills necessary for proficient reading.

Kirkley (1981) examined whether the frequent use of advance organizers in the content areas would significantly improve the reading comprehension of junior high school compensatory education students. The results of this study entitled "The Effects of Advanced Organizers on the Reading Comprehension of Compensatory Education Students" showed that advance organizers could significantly improve reading comprehension.

These studies prove advance organizers to be useful. Some studies do not support a beneficial use for advance organizers when learning. Peverly (1981) examined whether pictures presented in advance of reading a text (advance organizers) as compared to pictures presented after reading a text (post organizers) would significantly enhance the reader's retention of the text's content. This study entitled "The Effects of Diagrams-Before Text vs. Diagrams-After Text in the Processing of Novel Information" used free recall and short answer criterion measures to assess comprehension.

Contrary to hypotheses, the only factor to affect the number of correct responses significantly and positively was the material presented second.

McAdaragh (1981) examined "The Effect of Background Experience and an Advance Organizer on the Attainment of Certain Science Concepts." Ninth-grade earth science students were given a pretest concerning scientific background knowledge and placed into high, medium, and low experience groups. Each group was subdivided into an experimental group and a control group. The experimental group was given an advance organizer and the control group was not. A postest was given after two weeks and it was concluded that neither the advance organizer nor the background experience of the student made a significant difference in achievement. There was no significant interaction between method and background experience of the student.

Stone (1983) in "A Meta-Analysis of Advance Organizer Studies" analyzed 112 studies with Glass's meta-analysis technique. The results were compared with predictions from Ausubel's model of assimilative learning. Overall, advance organizers were shown to be associated with increased learning and retention of material to be learned. Advance organizers seem to be effective in providing a framework for incorporating new information with what is already known. The use of a model organizer can result in student perceptions of improved understanding but the reason for this effect is not known.

REFERENCES

1. Adejumo, Dayo; Ehindero, Sola. "Facilitating Learning of Science-Oriented Textual Material in a Developing Country: Study in the Use of Organizers." Science Education, 64, Jul 1980, 397-403.

2. Alexander, Livingston, Frankiewicz, Ronald G., & Williams, Robert. "Facilitation of Learning and Retention of Oral Instruction Using Advance and Post Organizers." Journal of Educational Psychology, 71, 1979, 701-707.

3. Alverman, Donna E. "The Compensatory Effort of Graphic Organizers on Descriptive Text." Journal of Educational Research, 75, Sept/Oct 1981, 44-8.

4. Amerine, Floriene J. "First Things First." Clearing House, 59, May 1986, 396-397.

5. Anderson, Ronald D.; And Others. "Science Meta-Analysis Project: Volume I Final Report." Colorado University, Dec 1982, 406p.

6. Ausubel, David P. "The Use of Advance Organizers in the Learning and Retention of Meaningful Verbal Material." Journal of Educational Psychology, 51, 1960, 267-272.

7. Barnes, Buckley & Clawson, Elmer. "Do Advance Organizers Facilitate Learning?" Review of Educational Research, 45, Fall 1975, 637-659.

8. Carnes, Ernest R.; And Others. "Effects of Group Size and Advance Organizers of Learning Parameters when Using Microcomputer Tutorials in Kinematics." Journal of Research in Science Teaching, 24, Dec 1987, 781-789.

9. Cassidy, Jack. "Project C.A.R.E." Teacher, 94, Jan 1972, 70-72.

10. Darch, Craig; Carnine, Douglas. "Teaching Content Area Material to Learning Disabled Students." Exceptional Children, 53, Nov 1986, 240-246.

11. Farris, Pamela J.; And Others. "Text Organization and Structure in Science Textbooks." Reading Horizons, 28, Win 1988, 123-130.

12. Gennaro, Eugene D. "The Effectiveness of Using Previsit Instructional Materials on Learning for a Museum Field Trip Experience." Journal of Research in Science Teaching, 18, May 1981, 275-279.

13. Giles, Thomas; Bell, Paul E. "Investigating Learning Mediators in the Planetarium Classroom." 1982, 15p.

14. Graber, Richard A., Means, Robert S. & Johnsten, Thomas D. "The Effect of Subsuming Concepts on Student Achievement on Unfamiliar Science Learning Material." Journal of Research in Science Teaching, 9, 1972, 277-279.

15. Hawk, Parmalee P. "Using Graphic Organizers to Increase Achievement in Middle School Life Science." Science Education, 70, Jan 1986, 81-87.

16. Kahle, James B. & Rastovac, John J. "The Effects of a Series of Advance Organizers in Increasing Meaningful Learning." Science Education, 60, July 1976, 365-371.

17. Karakalios, Sue M. Tonjes, Marian J., & Towner, John C. "Using Advance Organizers Improve Comprehension of a Content Text."Journal of Reading, 22, May 1979, 706-8.

18. Kirkland, Alma L. "The Effects of Advanced Organizers on the Reading Comprehension of Compensatory Education Students." M. A. Thesis, Kean College of New Jersey, Apr 1981, 30p.

19. Lawson, Anton E. "The Reality of General Cognitive Operations." Science Education, 66, Apr 1982, 229-241.

20. Lawton, Joseph T.; Burk, Jill. "Effects of Advance Organizer Instruction on Preschool Children's Prosocial Behavior." 1988, 23p.

21. Levin, Joel R; And Others. "Mnemonic Facilitation of Text-Embedded Science Facts." American Educational Research Journal, 23, Fall 1986, 489-506.

22. Lott, Gerald W. "The Effect of Inquiry Teaching and Advance Organizers Upon Student Outcomes in Science Education." Journal of Research in Science Teaching, 20, May 1983, 437-451.

23. Mayer, Richard E. "Can You Repeat That? Qualitative Effects of Repetition and Advance Organizers on Learning from Science Prose." Journal of Educational Psychology, 75, Feb 1983, 40-49.

24. Mayer, Richard E. "What Have We Learned about Increasing the Meaningfulness of Science Prose?" Science Education, 67, Apr 1983, 223-237.

25. Mayer, Richard M. "Advance Organizers that Compensate for the Organization of Text." Journal of Educational Psychology, 70, Dec 1978, 880-6.

26. McAdaragh, Mary Kathleen. "The Effect of Background Experience and an Advance Organizer on the Attainment of Certain Science Concepts." The University of Michigan, 1981, 184p.

27. Memory, David M. "An Extended Comparison of Adjunct Aids with Low-Average and Good Readers in the Sixth Grade." Journal of Educationl Research, 74, Jul/Aug 1981, 405-410.

28. Peverly, Stephen T. "The Effects of Diagrams-Before Text vs. Diagrams-After Text in the Processing of Novel Text Information." M. S. Thesis, Pennsylvania State University, Aug 1981, 133p.

29. Readence, John E.; Moore, David. "Strategies for Enhancing Readiness and Recall in Content Areas: The Encoding Specificity Principle." Reading Psychology, 1, Fall 1979, 47-54.

30. Rieber, Lloyd P.; Hannafin, Michael J. "The Effects of Computer Animated Orienting Activities and Practice on Application and Problem Solving Skills in an Elementary Science Lesson: An Exploratory Study." Feb 1987, 7p.

31. Steinbrink, J. E. "The Effects of Advanced Organizers for Teaching Geography to Disadvantaged Black Elementary Students." Dissertation Abstracts International, 31, 1971, 5959A.

32. Stone, Carol L. "A Meta-Analysis of Advanced Organizer Studies." Journal of Experimental Education, 51, Summer 1983, 194-199.

33. Thelen, Judith N. "Just Because Kids Can't Read Doesn't Mean They Can't Learn or Every Science And Mathematics Teacher Is Not a Teacher of Reading." School Science and Mathematics, 79, Oct 1979, 457-464.

34. West, Leo H. T.; Kellett, Natalie C. "The Meaningful Learning of Intellectual Skills: An Application of Ausubel's Subsumption Theory to the Domain of Intellectual Skills Learning." Science Education, 65, Apr 1981, 207-219.

35. Zeitoun, Hassan Hussein. "Advance Organizer Research: One Step Further." Apr 1983, 38p.

36. Zeitoun, Hassan Hussein. "Operationalizing Advance Organizers: A New Procedure." Feb 1983, 16p.